Siting of Power Plants & Wells for True/Mid-Pacific Geothermal Venture in the Kilauea Middle East Rift Zone Geothermal Resource Subzone.

1. Background

A geothermal resource assessment program was initiated in Hawaii in 1978 under the Western States Cooperative Direct Heat Resources Assessment Program. Its stated purpose was to identify and evaluate potential geothermal resource areas on all major islands. The principal areas of interest to prospective resource developers were those areas with the highest potential for a high temperature resource capable of producing electricity.

The resource assessment program identified the Kilauea east rift zone as the area with the highest potential: "Kilauea East Rift Zone: an extensive body of geological, geophysical, and geochemical data concerning the East Rift Zone is available and virtually all of this data indicates that a high-temperature thermal system is associated with the entire rift. Deep exploratory geothermal wells drilled into the rift zone has identified temperature in excess of 350°C, and continuous production from one of these wells for a period of more than two years indicates that sufficient recharge is available for production of geothermal electrical power. The probability for both a low and high temperature resource on this rift zone is 100%."

2. Acreage for Exploration and Development

Within potential resource areas, the amount of contiguous acreage that can be assembled for exploration and development is a crucial factor in enhancing prospects for an economically viable project at acceptable risks. The more land available, the better the chance of finding a producible resource and expanding development in the area of discovery. Larger land areas also provide more options in selecting power plant sites - an essential consideration when operating in an active volcanic rift zone. Moreover, larger acreage in a reservoir area could result in a lower development density and lower production rate per acre.

3. Events Leading To Location of T/MPG Project Site

In the case of T/MPG, the Campbell Estate parcels (first, Kahauale'a and now, Kilauea middle east rift zone) satisfied the basic criteria for a land area compatible with the economic risks inherent in a geothermal project in areas with limited data on resource potential. A summary of the events that have positioned T/MPG in the Kilauea middle east rift zone with permits and plans to develop 100MW of electricity is contained in Attachment 1 hereto.

If T/MPG is to supply a significant amount of the proposed 500MW base-load level of power to be exported to Oahu, it may be necessary that the current subzone would have to be expanded to (1) allow additional development areas, (2) to prevent possible exceedances of allowable emission levels that could occur with concentration of power plants in the current area, (3) and to minimize hazards risks that could otherwise prevail if 250-300MW of production were concentrated in the existing subzone. (A considerable portion of the current subzone would not be suitable for locating of power plants.)

4. Planned Siting of Wells and Power Plants

The well sites and power plant sites shown in T/MPG Exploration and Development Plan represent tentative sites based on the assumption that a geothermal reservoir is uniformly distributed or positioned under the rift zone. Thus, five (5) prospective exploration/development areas (EDA) were established to assure exploration and development over the entire subzone. This strategy is necessary to verify the existence of sufficient resources beneath the subzone to supply a significant portion of power for export by deep water cable.

a. Well Siting.

The positioning of well sites within the exploration/development areas (EDA) was based generally on geologic evidence which suggests the potential presence of a geothermal resource, modified by safety and environmental considerations. In selecting well sites, an added assumption was made that, ultimately, 4 to 5 wells could be drilled directionally from most of the well pads as "in-fill" wells provided that the underlying reservoir could sustain this density or well spacing. This type of field development would reduce the amount of clearing in the project area which could lessen environmental impacts and off-set a portion of the increased costs of directional drilling. The total number of well sites planned represents our estimate of the minimum number of successful sites to produce and sustain 100MW of power generation. It is further assumed that successful wells will produce 5MW of power, the controlling factor in the number of wells needed (plus reserve) to supply and sustain a contracted level of production.

b. Power Plant Siting

One tentative power plant site, of undetermined capacity, was located in each EDA with the objective that the maximum distance from a producing well to a power plant would be

limited primarily to about one mile to prevent excessive steam losses in transmission of the resource to the plant. Production efficiency and development/maintenance costs are significantly affected by the length of the pipelines from well to power plant, and therefore will be a major determinant, together with assessment of the volcanic hazards, in the final siting of a plant in relation to the supplying wells.

The decision on establishing the level of generating capacity at a site would be influenced by risk analysis of volcanic hazards and cost analysis related to distances to supplying wells.

5. Actual Siting of Wells and Power Plants

The actual siting of wells and power plants within the GRS may be entirely different than the plans presented depending upon the validity of early assumptions about the geology of the area and the characteristics of the resource as manifested in the drilling results from each well.

Therefore, the surface and bottom hole location of wells will be determined by information obtained from the previous well or wells and the hazards assessment of the area around the prospective well site in relation to a future plant site.

It follows that the location of production wells will, in turn, pre-determine the general location of a power plant subject to the competing factors of economics and volcanic hazards assessment for the plant site. As the boundaries and extent of discovered reservoirs are established through drilling, more comprehensive and detailed planning for power plant siting can be made.

In consideration of the foregoing, flexibility in selecting an exact point on the ground as the optimum location for a development well is probably limited to several hundreds of feet as opposed to thousands of feet since development wells will be located and spaced in areas of proven resources. In this context, it would be possible to avoid clearing some planned well site containing biological species worthy of protection.

This flexibility may be more restrictive with power plant siting in some cases because of the need to locate the plant near the supplying well field with special attention to the hazards risks for the site preferred.

There is more flexibility in locating roads to specific facility sites, as was the case with the access road into the first drill site which was deviated to avoid rare biological species. There would also be some flexibility in routing pipelines from the wells to the power plants as well as in selecting a transmission line corridor from power plant to project site boundary leading to interconnect point of the utility system.

Summary of Events Leading to Position
of T/MPG in Kilauea Middle East Rift Zone.

1. Initial conservation district use permit application filed with BLNR March 2, 1982 for development of 250MW of geothermal generated power on Campbell Estate's Kahauale'a parcel, Puna District, Island of Hawaii, resulted in contested case hearing in parts of Oct-Nov-1982.

2. Decision and Order and CDU permit issued February 25, 1983 granting limited exploration rights within a designated area of 800 acres.

3. State legislature subsequently passed Act 296 SLH 1983, requiring all geothermal development activities to be conducted only within designated "geothermal resource subzones", GRS. Objective of law to select areas that best demonstrated an acceptable balance among stated criteria, now codified in HRS 205-5.2.

4. Assessment of potential GRS began June, 1983 by Dowald, DLNR, but Act 151 in 1984 specified first priority in assessing GRS was the Kahauale'a area to be accomplished by December 31, 1984. Dowald proposed GRS area within Kahauale'a of 5300 acres.

5. Public hearing and contested case hearing held on September 12, and December 12-20, 1984, on designating proposed GRS in Kahauale'a on grounds that Kahauale'a contained higher quality Native habitat than was present in the adjoining state land (Wao Kele 'O Puna)

6. Decision and order (December 28, 1984) designated the 800 acres (previously designated in February 83, Decision and Order) as a preliminary GRS pending response to Land Board's request in Decision and Order to Campbell Estate to investigate and consider a land exchange involving the adjacent state owned land in the Kilauea middle east rift zone with Campbell's Kahauale'a parcel. Concurrently, the Board would direct action to assess the state's land for possible designation as GRS. If land exchange not consummated or GRS not designated in state land, the remaining 5,300 acres proposed by Dowald as GRS in Kahauale'a would be so designated.

7. Assessment of KMERZ for GRS designation is outlined in Dowald Circular C-114. A public hearing held on proposed designation of 11,745 acres on September 26, 1984 in Hilo followed by contested case on November 13-15, 1985 with essentially same parties to two previous contested hearings.

8. Decision and Order issued December 20, 1985 designating approximately 9,014 acres of the Wao Kele O' Puna area (Kilauea middle east rift zone) as a GRS.

9. Land exchange executed December 27, 1985.

10. CDUA application for exploration, development and production of 100MW of geothermal generated electricity filed with BLNR on December 20, 1985.

11. Public hearing held on _____ followed by contested case hearing on _____ with essentially same parties as with three previous contested hearings.

12. Decision and order and CDV permit issued April 11, 1986 authorizing exploration, development and production of up to 100MW of electricity in the Kilauea middle east rift zone.

SUSUMU ONO
3341 Ala Lilia Street
Honolulu, Hawaii 96818

August 10, 1990

Mr. H.A. Dave True, Jr.
P.O. Box 2360
Casper, Wyoming 82602

Dear Mr. True:

Thank you for meeting with Senator Matsuura and me to discuss issues associated with geothermal development in Hawaii. The session with you and Hank was most informative and gave me a better insight on the operations and objectives of the True Geothermal Energy Company.

Also appreciated very much are the courtesies extended to us by you, Mrs. True, Hank and the rest of your family and staff. May I add that the dinner at the ranch was most enjoyable.

Please be assured that I will continue to work with your organization in our efforts to develop Hawaii's geothermal resources.

Sincerely,

SUSUMU ONO

TRUE GEOTHERMAL ENERGY COMPANY

895 WEST RIVER CROSS ROAD

Phone (307) 237-9301
P.O. Box 2360
Casper, Wyoming
82602

August 6, 1990

Mr. Sus Ono
Office of Richard M. Matsuura
Senator, State of Hawaii
State Capitol, Room 201
Honolulu, HI 96813

Dear Sus,

You and Dick were certainly more than generous with your time and effort to visit us in Casper. Our optimism and our resolve regarding the Big Island geothermal project have been raised considerably as a result. I am indeed sorry that Diemer and David L. were both out of town while you were here.

You flattered me greatly by expressing an interest in my biography; and, under separate cover, I will be sending you a copy of Wyoming Wildcatter.

We have our fingers crossed and hopes high for the northeasterly deviated hole we are now drilling.

Thank you again for coming to Casper and giving our morale a lift.

With warm personal regards,

Sincerely,

H. A. True, Jr.

HAT/cm

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